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ACCOUNTING INFORMATION AND VALUE CHAIN ANALYSIS: An exploratory field study

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Abstract

Interfirm relationships introduce new challenges for management accounting. One such challenge is to provide the information for the coordination and optimization of activities across firms in a value chain. In literature it is argued that a value *analysis* is a method to meet this challenge. However, little empirical evidence currently exists on the use of this analysis in practice. This paper presents an exploratory case study on the use of an activity-based costing model by the U.K. retail firm J. Sainsbury's and a group of 36 suppliers for supporting supply chain management practices. This cost model is based on the principles of value chain analysis, and integrates cost information of firms across the value chain. This allows them to perform benchmark analyses, strategic what-if analyses and monitoring of supply chain costs for supply chain optimization.

Keywords: interfirm relationships, value chain analysis, case study

Contents

1. Introduction

Until recently interfirm relationships have gained little attention on the agenda of management accounting researchers, and only since a few years in accounting literature more attention is asked for this issue (Hopwood, 1996; Munday, 1992; Otley, 1994). The acknowledgement of the major implications of these relationships for the organization of activities and the related consequences for accounting and control within and between organizations has, however, led to an increase of interest (e.g., Anderson et al., 2000; Frances and Garnsey, 1996; Gietzman, 1996; Ittner et al., 1999; Seal et al., 1999; Tomkins, 2001). Some specific issues in interfirm relationships that are more intensively discussed in accounting literature are the make-or-buy decision and outsourcing of activities (Anderson et al., 2000; Gietzman 1996; Widener and Selto, 1999), inter-organizational cost management (Carr and Ng, 1995; Cooper and Slagmulder, 1999), and value chain analysis (Shank, 1989; Shank and Govindarajan, 1992, 1993).

This paper focuses on the use of value chain analysis (VCA) in interfirm relationships. In literature VCA is viewed as a core analytical tool of strategic management accounting. This method of analyzing the value chain for strategic improvement, was introduced by Porter (1985) and in management accounting literature further developed by Shank (1989) and Shank and Govindarajan (1992, 1993). The centra1 idea of the analysis is to break up "the chain of activities that runs from basic raw materials to end-use customers into strategically relevant segments in order to understand the behavior of costs and the sources of differentiation" (Shank and Govindarajan, 1992, p.180). The development of VCA in literature, however, has primarily been conceptual. Little empirical evidence of its use in practice exists, which has been a reason for criticism on the relevance of the concept for practice (Lord, 1996). In this paper an empirical analy-

sis of the use of VCA by the U.K. retail firm J. Sainsbury's and a group of its suppliers is provided. This company has developed a activity-based costing model, for performing cost analyses of the supply chains with its suppliers. To the author's knowledge, no empirical evidence on the use of such practices by firms has been published in literature before.

The remainder of this paper is structured as follows. First, the role of management accounting in interfirm relationships will be discussed. After this genera1 discussion, the concept of VCA will be discussed in more depth. In particular, the use and problems of accounting information for supporting this analysis will be focused on. Then a case study is presented of how Sainsbury uses the VCA concept in its supply chain management efforts with suppliers. This case study will be followed by a discussion, in which it is suggested why little empirical evidence has been found up to date. The paper ends with a conclusion, and some avenues for further research into this subject.

2. Management accounting in interfirm relationships

Especially when compared with other fields of organizational research, such as management, organizational behavior and strategic management research, it can be observed that the issue of interfirm relationships has had little impact on management accounting research. Looking at those other areas of organizational research, however, learns that despite the extensive attention towards interfirm relationships, little attention has gone out to the actual *management* of those relationships. Most research has focused on the explanation of the *choice* for and of the (governance) *form* of interfirm relationships (Gulati and Singh, 1998; Spekman et al., 1998). Particularly in the management of interfirm relationships the role of management accounting information can

be significant. For instance, in a strategic alliance between a buyer and supplier of railway safety equipment, management accounting practices were intensively used by the partners for the management and control of the alliance (Dekker, 2000). These specific practices were used to coordinate innovations and to safeguard the partners' interests, and consisted of a financial incentive system, planning and budgeting, and performance measurement based on open book accounting. Tomkins (2001) calls for an increased focus on the management of interfirm relationships, by arguing that 'the area warrants more empirical research with a greater emphasis upon business processes and the use of accounting in action/negotiation' (p. 164).

Seal et al. (1999) discuss three areas of common ground between management accounting and interfirm relationships: (1) the make-or-buy decision that can lead to the initiation of a partnership, (2) the use of management accounting in the actual management of a partnership and (3) the partners' responsibilities to each other, inducing the use of performance measurement. It can be argued that the relationship between management accounting and interfirm relationship is not unidirectional: management accounting may both influence, and be influenced by interfirm relationships. These influences may change over time, depending on the stage of the relationship in the relationship life cycle (Spekman et al., 1998).[1] This relationship life cycle can be described by a phase-model, consisting of four phases: initiation, design, execution and decline. In the initiation phase one firm recognizes the need for or benefits of initiating an interfirm relationship, and selects an appropriate partner (or more) for this purpose. After this potential partner agrees to the proposal to collaborate, the design phase is entered, in which the relationship is shaped by designing a govemance structure that arranges the functioning of the alliance.[2] In the execution phase the actual execution of the activities for which the relationship was started, takes place. Finally, the relationship may be terminated, for example because performance (of the alliance or of one of the partners) is

below expectations, or simply because the relationship was started only for a predetermined period or project.

On the one hand management accounting can have an influence on interfirm relationships in these different phases. For instance, management accounting can be beneficial at the initiation phase, influencing the startup of a relationship between organizations. Make or buy calculations, for instance, can indicate the benefits of allying with a supplier, instead of internal production.' In an existing interfirm relationship a value chain analysis could indicate the benefits of closer coordination in a supply chain, for improving the efficiency and effectiveness of the supply chain (Porter, 1985). And performance measurement information may lead the partners to the conclusion that a termination of the alliance may be the best way forward.

On the other hand, the initiation of interfirm relationships may influence the role of management accounting *within* and *between* the cooperating organizations. For instance, accounting systems may be needed to calculate costs and benefits of the cooperation and to allocate these among the partners. These systems may be developed at the design stage of the relationship, in which partners wish to safeguard their interests, before making investments specifically for the relationship. And management accounting may be needed in order to control the behaviors and performances of the cooperating parties during the execution phase. In addition, management accounting may not only be needed for creating incentives, but may also be used for the coordination and control of activities to be performed (Dekker, 2000). Budgeting and performance measurement systems for example can be useful in this respect. Finally, when partners decide to terminate the alliance an accounting problem arises how to allocate the resources invested in and generate by the relationship among the partners." These different implications of interfirm relationships for management accounting, and *vice* versa, clearly illustrate the

significance of this issue for management accounting research. As little empirical knowledge about this issue has been published, (exploratory) field research, generating empirical descriptions and explanations of the use and consequences of management accounting in interfirm relationships, may prove to be a successful research strategy for developing this area.

One issue in interfirm relationships, in which management accounting information is argued to play an important role, is the *value chain analysis (VCA)*. This analysis, which builds on the concept of the *value chain*, was developed by Porter (1985), and in accounting literature further addressed by Shank (1989) and Shank and Govindarajan (1992, 1993). Performing a VCA can be beneficial in several phases of the relationship life cycle. First, a VCA can be the impetus for initiating a cooperation, by indicating the benefits that closer coordination in an interfirm relationship can result in. Second, VCA can be used in the actual management of an existing relationship, to identify possibilities for improvement in the value chain.

3. Value Chain Analysis in intertirm relationships

According to Porter one important purpose of strategic cost analysis is to better manage linkages between buyers and suppliers in the value chain. A value chain is defined as "the linked set of value-creating activities all the way from basic raw material sources for component suppliers through the ultimate end-use product delivered into the final customers' hands" (Shank, 1989, p.50). A VCA then is a structured method to analyze the effects of strategically important activities on the *cost* and/or *differentiation* of the value chain. In a VCA different types of relationships or 'linkages' can be distinguished: relationships between activities, relationships between Business Units of the

firm, and vertical relationships between the firm and its buyers and suppliers (Porter, 1985). This latter type of relationships, referred to as 'vertical linkages' in the supply chain, describes how a firm's internal value chain is related to those of buyers and/or suppliers. A linkage expresses the relationship between the performance of one activity and its effects on the performance of another activity. In other words, a linkage exists when there is a certain degree of interdependence between activities (Shank en Govindarajan, 1992). In a relationship between a buyer and a supplier, linkages express how the supplier's activities influence the buyer's activities in terms of cost and differentiation, and *vice versa*. Often in literature it is not made clear what a VCA refers to, whether it is an internal oriented analysis of the activities within the firm, or whether it is an extemally oriented analysis of the activities across firms in a supply chain. This paper focuses on the latter type of analysis, i.e. the analysis of linkages between activities of firms at different positions in the value chain.

According to Porter (1985) managing linkages in the value chain, which is also the centra1 idea of the concept of *supply chain management* (SCM), can lead to a competitive advantage by reducing costs and enhancing differentiation. A VCA can be used to determine where in the value chain costs can be lowered or differentiation can be enhanced (Shank and Govindarajan, 1992). For performing this analysis and for managing linkages in the value chain, cost information is an essential element.

3.1 Accounting information for Value Chain Analysis

> *While accounting systems do contain useful data for cost analysis, they often get in the way of strategic cost analysis (Porter, 1985, p.63)*

Porter's critique on what now are termed 'traditional' accounting systems, referred to the inability of those systems to adequately support a VCA. Traditional management

accounting practices are based on the internally oriented concept of *value added.* As Shank (1989) argues, a fundamental problem of this concept is that it "starts too late and it stops too soon" (p.5 1). He argues that by starting cost analysis not earlier than the costs of purchases, possibilities for exploiting linkages with suppliers are missed. And by stopping the cost analysis already at customers' sales, possibilities to exploit linkages with those customers are missed. The value added perspective focuses only on (maximizing) the difference between purchasing costs and selling price, and ignores linkages in the wider value chain, such as the causes of this purchasing price, the costs of activities related to the product, and the consequences of the product for the activities of the buyer. Accounting systems that do account for costs that are caused by buying at a certain supplier, such as costs of ordering, delivery, quality and administration, are so-called *Total Cost of Ownership (TCO) systems* (Carr and Ittner, 1992). Compared to the scope of a VCA, TCO systems only analyze the effects of buying at a supplier on the costs of the internal organization. NO extemal value chain perspective is taken, in which costs are analyzed for the overall chain. A VCA also includes the supplier's activities and costs, and recognizes the interdependencies of activities and costs across the value chain. In order to perform this last type of analysis across different firms in the value chain, *in principle,* an integration of cost data of those different firms would be required.

The differences between the concepts of value added, TCO and VCA, in terms of (potential) scope of the analysis, can graphically be illustrated for a three firm value chain as in figure 1.

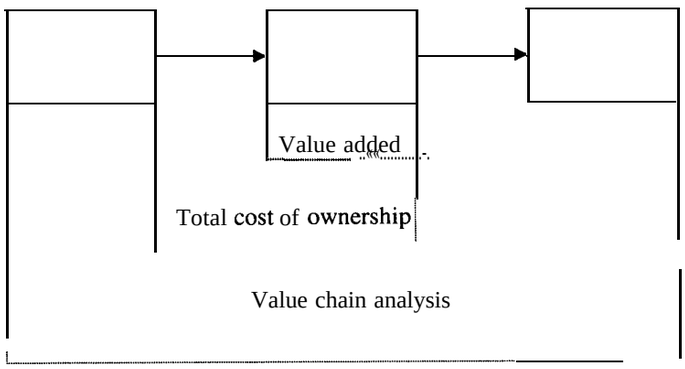

Figure 1 A comparison of the Value Added, Total Cost of Ownership and Value Chain Analysis concepts

Hergert and Morris (1989) addressed the problems mentioned by Porter in more detail, and concluded that traditional accounting systems have several deficiencies for supporting strategic planning, and consequently for VCA. These can be summarized as follows:

When the firm is not organized around Strategic Business Units (SBU's), the accounting system will not recognize the SBU as a dimension for data accumulation;

Traditional accounting systems do not focus on critical activities as a VCA does, but on responsibility centers;

Traditional accounting systems do not identify factors creating buyer value, which need to be treated as cost objectives for accumulating costs, revenues and assets;

Traditional accounting systems do not account for interdependence between subunits (such as activities), while cost and performance of one subunit often is dependent on the costs and performance of other subunits;

Cost center budgets are often a poor reflection of the economics of performing an activity, traditional accounting systems do not accumulate data about the drivers of costs.

Since the publications of Porter (1985) and Hergert and Morris (1989) several man-

agement accounting innovations have been introduced in the literature, of which in particular *Activity-Based Costing* (ABC) and the concept of *Strategic Cost Management* are important to the problems discussed above. ABC offered a solution for some of the problems of performing a internally oriented VCA, as it assigns costs to activities and identifies the specific drivers of those costs. Shank (1989) and Shank and Govindarajan (1992, 1993) subsequently developed the concept of Strategic Cost Management, in which accounting information is used for developing and supporting a firm's strategies. This concept in literature later was broadened to *Strategic Management Accounting (SMA)*, which consists of analyses of different strategic dimensions of the firm, such as competitor analysis, strategic positioning analysis and analysis of the value chain which the firm is part of (Lord, 1996). SMA posits that management accounting information can be useful for supporting decisions related to these different strategic dimensions. The exploitation of linkages with suppliers and buyers is thus explicitly positioned as an important constituent of SMA. In the next paragraph it is discussed how a VCA is performed within the framework of SMA.

3.2 Performing a VCA

Shank and Govindarajan (1992, 1993) describe a methodology of how to perform a VCA. In their conception, a VCA explicitly takes account of the interdependence between activities of buyer and supplier. In the analysis the value chain is decomposed into strategically relevant activities, and costs, revenues and assets are assigned to these value activities. For each value activity that has been defined, the cost drivers are identified that cause the economic behavior of the activity. These steps enable to analyze the behavior of costs and the sources of differentiation. When performing a VCA, insight is gained into the relationships between the activities of buyers and suppliers, with respect to cost and differentiation. The last step they mention is to use the analysis to better control cost drivers (than competitors do) or to reconfigure the value chain, in order to

develop a sustainable competitive advantage. In principle, they argue, competitive advantage can be gained either by reducing costs, keeping value constant, or by increasing value, keeping costs constant.

Shank and Govindarajan's description of the VCA methodology assumes the analysis is performed by one organization, looking outside the organization to the related firms in the value chain (i.e., an extemal perspective). In interfirm cooperative relationships, however, a VCA can also be performed *jointly* by multiple firms in the supply chain. This is the case of the VCA practices of Sainsbury's and its suppliers, as will be discussed in the next section. This joint analysis of the value chain integrates cost data of those multiple firms, leading to a broader scope than an intemally oriented VCA, and a higher accuracy of cost data than when the analysis is performed by one firm taking an external perspective.[5]

For the analysis of cost behavior it is important to have 'good' management accounting information. In literature ABC is mentioned as an important framework to use when performing a VCA (Guilding et al., 2000; Mecimore and Bell, 1996; Shank and Govindarajan, 1992, 1993). When based on ABC-principles, much of the problems of accounting systems for performing the VCA discussed by Hergert and Morris (1989) are solved.[6] The cost and cost driver information resulting from the analysis can be used, as suggested by Porter (1985), to optimize and better coordinate the performance of activities in the supply chain. For example, a VCA may lead partners to conclude that supply chain costs will be reduced when the supplier delivers products in another form, improving the efficiency of the buyer's receiving and stock keeping activities, or when activities (such as stock keeping) are aligned with firms in the supply chain who can perform them more efficiently (Dekker and Van Goor, 2000; LaLonde and Pohlen, 1996).

Empirical evidence on the use of VCA in practice is limited. It is not clear whether firms perform VCA's and if they do so, whether they do that according to the methodology proposed by Shank and Govindarajan. It has even been argued that, because of the lack of evidence on SMA, including VCA, this may be just 'a figment of academic imagination', with little relevance or interest in practice (Lord, 1996, p. 364). Tomkins (2001) also expresses his doubts about the extent to which companies go in cross-organizational cost management (p. 163). Chenhall and Langfield-Smith (1998) and Guilding et al. (2000) provide survey evidence on the adoption of SMA practices, including VCA practices, by large firms in respectively Australia, and New Zealand, the United Kingdom and the United States. However, these adoption rates are based on global descriptions of the VCA method, and no insight is gained into what these practices actually consist of. In addition, regarding their descriptions of the method, these results (probably) only account for the use of an intemally oriented VCA of the firm, not an analysis of activities across the wider value chain. No empirical evidence has been published in literature on the use of VCA across firms in a value chain. The next section presents an empirical account of the use of such a VCA by the U.K. retail company J. Sainsbury's and a large group of its major suppliers.

4. The use of VCA at J. Sainsbury's

4.1 Research design

This section discusses the results of an exploratory case study into the use of a supply chain costing model by the U.K. retail firm J. Sainsbury's (from now on Sainsbury). Sainsbury has developed this model for supporting its supply chain management (SCM) practices with suppliers. Specifically, the model is used for analyzing the costs of activities of several firms in the supply chain to identify ways to reduce costs, and is based on similar principles as a VCA as discussed before. The selection of this case resulted from coincidence, as the existence and use of the model was identified as a result of a presentation of a company representative, about the use of ABC information for SCM practices. Because of the lack of evidence in literature about the use of VCA in practice, it was decided to further explore the use of this model at the company.

Exploratory case studies are especially useful for researching phenomena about which little empirical evidence is available, to find answers to how and why questions about these phenomena (Yin, 1994). However, the case study was not entered completely 'blank'. Based on existing literature about interfirm relationships, supply chain management, and ABC, and on the company data already available, an interview protocol was developed.[7] This protocol structured the data collection process of Sainsbury's SCM and VCA practices into three different topics: (1) company information, (2) the management of relationships with suppliers, and in particular SCM practices, and (3) the cost model. The data was collected in 1998. As, to the author's knowledge, this is the first empirical description of the use of VCA practices across a value chain, the presentation of the case study will primarily be descriptive. Questions discussed in this case study relate to the initiation, design, goals, and use of the cost model for supporting SCM practices.

4.2 Supply chain management at Sainsbury's

Since the company has been dethroned by Tesco in 1995, Sainsbury ranks as second largest retailer in the U.K., when measured in market share (Wheatley, 1998). In 1998 the company had over 23.000 different products on its shelves, supplied by approximately 4.000 suppliers. Based on the type of products these suppliers deliver, Sainsbury classifies them into six different networks: *produce, main ambient, slow moving ambient, bulky goods, chilled* and *frozen.* Around 1993, Sainsbury changed its way of working with suppliers by no longer using its power towards suppliers, which resulted in adversarial relationships, but to focus on cooperative relationships, to be able to improve supply chain performance. The idea behind this change of attitude was that the supply chain should not be perceived as a source of costs, but, to the contrary, should be regarded as a source of competitive advantage (Wheatley, 1998). These changes took place in a period in which U.K. retailers intensively reorganized their business processes, in which new information systems were introduced into the supply chain to reduce waste of resources and to improve the coordination of activities, referred to as *Efficient Consumer Response* (ECR), and *Quick Response Partnershipping* (Frances and Garnsey, 1996). In 1998, for example, Sainsbury launched a comprehensive management information system on the internet, called *Sainsbury Information Direct (SID),* which is used for coordinating activities with suppliers. SID consists of a diverse set of tools for information exchange for better coordination of activities, such as Web-EDI, joint promotion planning, performance measurement systems, and communication systems.[8] Before this period of reorganizing activities in the supply chain, Sainsbury had little contact with suppliers about the functioning of the supply chain.

Sainsbury's SCM efforts are performed by the department of Logistics. For managing the supply chain, three types of suppliers are distinguished, primarily based on the

volume that they deliver, but also on the *strategic importance* of their products for Sainsbury. The 24 key suppliers together account for approximately 30% of all products sold by Sainsbury, and were referred to as 'core suppliers'. In 1996 Sainsbury and these suppliers have formed the ***Supply Chain Development Group (SCDG),*** which initiates activities for improving the supply chain. As these suppliers have a major impact on the supply chain and also have sufficient resources for carrying out large projects, the most important supply chain improvement projects are performed with them. Yearly, senior managers of companies in this group meet in a 'strategic forum' to exchange information, to present the changes they are implementing in their supply chain, and to keep up personal contacts. In addition, meetings are held with individual members of the group to discuss developments in the supply chain and to initiate improvement projects, such as the development of collaborative planning systems, which are subsequently worked out in detail in joint project teams. The SCDG uses SID for exchanging information with members about projects that are being executed, such as reports, results, and opinions.

The second type of suppliers distinguished for SCM practices were referred to as 'middle-large suppliers', with whom individual actions for improvement have too little impact to justify the costs of those actions. However, when treated as a group, significant improvements can be realized with them (i.e., a critical mass needs to be realized). For instance, this is the case with cross-docking. When using cross-docking, suppliers do not deliver directly to all Sainsbury's regional distribution centers (RDC's) anymore, but instead deliver to a primary consolidation center (PCC or intermediate warehouse). In this PCC, deliveries of different suppliers for different RDC's are bundled, which are then transported by Sainsbury to the RDC's. This practice can result in large efficiency gains, as each supplier can reduce its number of deliveries from many to one, and Sainsbury transports only once to every RDC. However, for cross-docking to be benefi-

cial, a large group of suppliers that frequently deliver orders of a reasonable size is required. Deliveries from middle-large suppliers are of such a size that they do not deliver full loads at the RDC's, and are therefore suited for cross-docking. As orders at the core suppliers are of sufficient size that they, on a daily basis, deliver full vehicles to the RDC's, cross-docking results in no benefits for the supply chain. Because the number of middle-large suppliers at Sainsbury is growing, the impact of this group on cost and performance is als0 increasing.

The third type of suppliers distinguished in SCM practices were referred to as 'small suppliers', which often deliver a smal1 number of products in low volumes. Specific actions for improving the supply chain with smal1 suppliers have little impact on costs and performance. These suppliers primarily take part in genera1 actions for supply chain improvements, such as the web-EDI, that Sainsbury has developed for all (especially for smal1 and middle-large suppliers), as a cost reducing alternative for the costly normal EDI-systems. This web-EDI improves information exchange, by enabling suppliers to receive orders and production planning forecasts, and to send invoices to Sainsbury by the internet.

In addition to having intensified contact with its suppliers for SCM practices, Sainsbury has intensified contact with competitors, such as Tesco and Safeways, to discuss supply chain improvements, for example during *Efficient Consumer Response* conferences. It is possible that changes in the supply chain can only result in benefits, when more retailers cooperate in the initiative, for example, because a certain scale may be required for realizing the benefit. For example, the use of a new technology in RDC's, by which crates can be traced electronically (see also Wheatly, 1998), will only result in supply chain improvements when more retailers take part in the initiative, as otherwise the investment in the technology, and the supplier's different ways of working with retailers is

too costly and ineffective. Acknowledging this dependency on competitors, Sainsbury will tell them *what* they are doing or are planning to do (the electronically tracing of crates), in order to persuade them also to adopt the idea for improvement. However, Sainsbury will not tell *how* the company is doing it (the actual implementation and integration into existing systems), as this type of knowledge is perceived as a competitive advantage. SCM thus does not necessarily refer to a collaboration between buyer and supplier per se, but can also require a cooperation with or contribution of competitors.

In the previous situation, in which Sainsbury had little contact with suppliers, there was little insight in the costs of activities and the performance of suppliers in the supply chain, as these were not measured. Therefore, supply chain cost and performance management was diftïcult to realize. Five years ago Sainsbury decided to improve possibilities for supply chain control, amongst others by developing a cost model for SCM.[9]

4.3 A cost model for value chain analysis

Until 1996, the only insight Sainsbury had into the costs of the supply chain were the yearly distribution costs. This information provided little possibilities for coordination and control of activities in the supply chain. As argued by a Logistics project manager:

"It wasn 't really a supply chain measure of performance. You certainty couldn 't say well, this level of performance in the supply chain is gonna cost us this amount of money. We didn't know what the costs were. You know, we didn't know where the cost felt within the supply chain. "

To support their SCM efforts, Sainsbury's senior management requested the Logistics department to develop an ABC model of the supply chain, as ABC was perceived as a 'key enabler' of such practices (see also Coopers & Lybrand, 1996). The specific request was:

' To provide Senior Management with a greater understanding of the Total Supply Chain Process in order to improve decision making and deliver a clear understanding of the interrelationship of costs and the activities that drive them' [Sainsbury presentation].

The purpose for building this model was to enable Sainsbury to analyze the costs of activities in the supply chain with suppliers in order to reduce costs and to better monitor and control costs. More specifically, the goal of the model is to perform activity and cost driver analyses to gain insight into the supply chain costs, to generate ideas for cost reduction and to calculate the cost effects of changes in supply chain activities.

The design of the model

For the development of the model the following definition of the boundaries of the supply chain was used:

'All activities involved in moving the product from the end of the suppliers ' production line onto the supermarket shelf '[Sainsbury presentation].

These boundaries of the supply chain thus include the supplier's activities, Sainsbury's distribution activities, and Sainsbury's retail activities. Sainsbury graphically visualizes the (complex) structure of its supply chain drawing by the flows of products that go through it, as in figure 2.

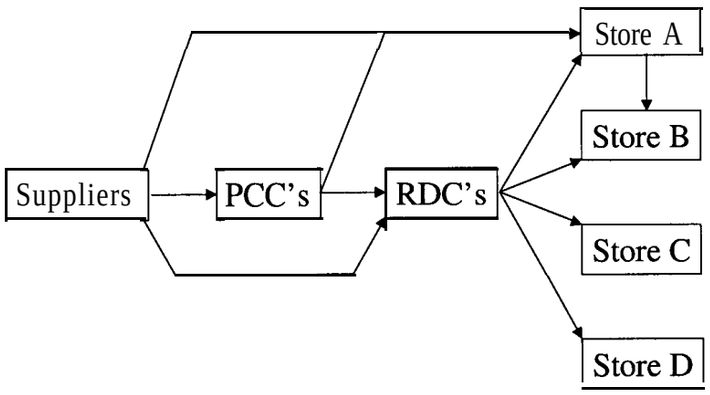

Figure 2 The structure of Sainsbury's supply chain

Suppliers can thus deliver to PCC's, to RDC's or directly to the stores. When a supplier delivers to a PCC or RDC, then Sainsbury takes care of further distribution in the supply chain to the stores. The design of the cost model reflects this supply chain structure. It contains different sections reflecting the activities performed at different stages of the supply chain. The sections distinguished are *"suppliers"*, reflecting the suppliers' activities, *"distribution"*, reflecting Sainsbury's distribution activities, and *"retail"*, reflecting Sainsbury's retail activities related to the supply chain. Each of these sections contains around 20 standard activities, which are possibly (but not necessarily) performed in the supply chain with a supplier. Thus, compared to figure 1, the scope of Sainsbury's cost model can be presented graphically as in figure 3.

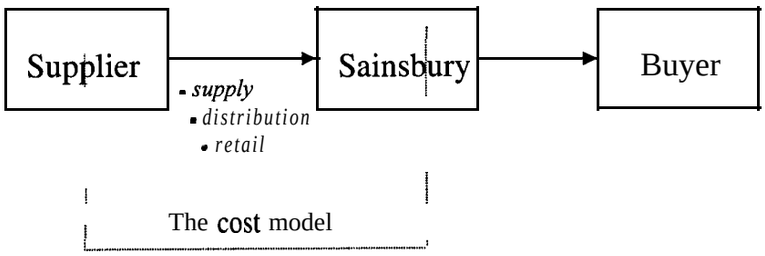

Figure 3 The scope of Sainsbury's cost model

The model thus does not reflect all value chain activities, but only activities related to moving the products through the supply chain to the stores' shelves. For each activity a cost driver is identified. A standard categorization of activities and cost drivers is used, as when compared to each other, most suppliers perform similar activities. The argument for using a standard categorization of activities was set forward by a project manager involved in the development and use of the model, who argued that:

"We find that some suppliers would do some activities, not other activities, but all the activities that they want to do are in there. Like unloading, all the suppliers have to unload. Picking, all the suppliers have to pick, whether they pick by board automatically in a big automated warehouse, or whether they pick manually by walking around, they all pick. The difference is that the cost would be different, and the make up of the cost would be different. So, you know, one supplier's cost would be almost solely equipment maintenance and running, whereas another one's has got labor in there, and those associated costs. That's what we're looking for really, we're looking for the difference".

Thus even though differences may exist between suppliers' operations, the model allows all activities they perform to be included. The model uses cost and activity

information of both Sainsbury and the suppliers, and thus integrates cost information of firms across the value chain. The costs (referred to as 'resources' in the model) consist of the supply chain related costs of suppliers, PCC's, RDC's, stores, and Sainsbury's head office. The costs of both parties are allocated to the activities and cost drivers in the model. This exercise leads to an insight into the costs of activities in the supply chain. As the model does not relate costs to cost objects (e.g., products), but only to activities, it can be considered as a form of *Activity Cost Analysis* (Gosselin, 1997).[10] This is acknowledged by the project manager, who commented that:

"Its not really true ABC as such you know, we haven't got the profit sides and everything all that in there, which is a different kind of fish. Purely really these are a list of activities, and these are the costs that are attached to those activities".

The model is designed to be able to analyze activity costs from different perspectives: per *supplier network* (as discussed before), per *geographical region* (Sainsbury distinguishes six regions where activities are performed), and per *store category* (stores are classifíed as *super store, medium, small* or *product).* Sainsbury perceives the model as fairly simple and of high aggregation level. More detail, it was argued, is not necessary, because this leve1 of detail is sufficient for realizing the model's goal, as discussed before. The structure of the model can be summarized as in table 1.

Supplier	PCC	RDC	Retail
Network	*Location*	*Location*	*Location*
Activities	*Network*	*Activities*	*Store category*
Cost elements	*Activities*	*Cost elements*	*Activities*
	Cost elements		*Cost elements*

Table 1 The structure of the cost model

The content of the model

To be able to analyze the supply chain costs with the model, cost and cost driver data are required from both Sainsbury and suppliers. At the time of the study, the model contained two years of actual cost and cost driver data of Sainsbury and 36 suppliers. The suppliers participating in this initiative were mainly the larger suppliers (in terrns of volume), with whom much work in improving the supply chain was already going on. These suppliers were involved first, because of the large volume of activities, leading to higher benefits, and because the joint SCM activities already taking place signified their willingness to participate in this type of efforts. The number of suppliers providing data was expected to increase, as several suppliers at that time were collecting the required data, or were investigating the possibilities for data collection.

Suppliers are free to choose whether or not they are willing to participate in this initiative. When they decide to participate, they are required to deliver cost data and cost driver quantities to Sainsbury for feeding the suppliers side of the model. Suppliers have to collect the data themselves. In order to assist them in this effort and to secure consistency of data across suppliers, a three page document is provided to new participating suppliers, in which the data required for the model is described, and in which definitions of activities are provided. The reason for not providing a more detailed manual for data collection is that this would scare off suppliers from participation, as it would signal high complexity and a time consuming data collection process. In addition to the document, Sainsbury assists suppliers by informing them how they have collected the data. However, it was argued, Sainsbury does not have the time, nor the resources, to assist all new participating suppliers in their data collection efforts. Only in the development phase of the model Sainsbury participated in data collection at a few suppliers, to learn which information is required and how to collect it.

Suppliers thus have their own responsibility for proving reliable data. As it is not in their interests to provide unreliable information, Sainsbury does not perceive this as a risk for the reliability of the model." Suppliers can provide their data in different formats. Some suppliers provide genera1 ledger data, and related cost driver quantities, leaving Sainsbury to do the cost analysis. For other suppliers, however, the data collection process is a stimulus for als0 executing an ABC-analysis for internal purposes. Some suppliers, for instance, already had the wish to start an internal ABC-study, and the need to collect data for the cost model induced them to get started with that process. These suppliers generally provide cost data in such a format that it can be fed into the model directly. As has often been the case with the development of internal ABC-models (see for example Gosselin, 1997), Sainsbury experienced that already during the data collection process suppliers often realize benefits by identifying possibilities for (individually or jointly) improving processes, simply as a result of a better insight into their processes and costs. This has also been the company's own experience during the development of the model.

The cost model is maintained by Sainsbury's *Supply Chain Finance Group.* Quarterly, they update the model with Sainsbury's cost and cost diver data. Suppliers need to provide new data once a year for updating the model. In addition, when a supplier implements important changes in its processes, the model is updated ad hoc.

Analyzing the supply chain

Each time the model has been updated, the supply chain costs are analyzed. This analysis results in an insight into the costs that have been generated by activities of Sainsbury and the suppliers. Participating suppliers receive the results of these analyses, which include their own activity costs, Sainsbury's activity costs related to their activities, and the average activity costs of the network. More specifically, the Logistics project

manager commented that:

"They see the proportion of our costs that plots to them. So they won 't see our entire structure, what they'll see, they'll see their costs as it goes to ours that we spend moving their stuff through the supply chain, plus an average cost for that network, so they can see how they do against the average as it moves through our network. They won't see the resource element of it, but they'll see it once its split down into activities. So they '11 actually see the activities and cost object side of it. So they'll see the cost as it goes to the distribution network, also the costs as it goes into our different stores."

Sainsbury's Logistics Operations department is the main user of the supply chain cost information. They use the outcomes of the cost analyses to initiate discussions with suppliers about the cost performance of the supply chain and its underlying processes. These discussions with suppliers are the most important goal of the cost information, in which it is used for generating ideas to reduce costs. Specifically, three types of analyses are made to support these discussions and to identify opportunities for cost reduction: *benchmark analyses, strategic what-if analyses* and *trend-analyses.*

Benchmarking is used to compare suppliers' activity costs with the average of their network. In addition, cost comparisons are made between networks, regions and store types. By clustering suppliers into different networks, the most important differences between their operations are eliminated for the benchmark analyses, as suppliers within a network perform fairly comparable activities. As argued by the project manager:

"I think, the fact that we break down into network covers most of our basic differences, because essentially the operation is the same for all suppliers. We're not

looking at their production side, that's not included, there's a lot differences in their production side. But from once it has been made, they are going through pretty much the same processes. You know, they all forecast, they all produce picking lists, they all pick, they all load vehicles and they all transport. Below that level there are differences, but those are what we look at afterwards". [..] "We look at the high level figures first, and then we can start looking at well why is this different, because theirs is made up with these subactivities, and theirs is these subactivities".

The most important measure for the benchmark analysis is the cost per cost driver (i.e., the cost driver rate), as this measure can be compared directly with other suppliers. For this purpose it is important that activities are defined accurately and tbat suppliers do not interpret the content of activities differently. The benchmark analysis reveals the activities the supplier performs better or worse than the network average. When a supplier deviates significantly from the average, the Logistics Operations department initiates a discussion with the supplier to find the cause(s) of the difference, by analyzing the underlying activities, and to assess whether and how performance can be improved. A similar procedure is followed for comparable activities between networks, geographical regions and store types. As suppliers in different networks face no competition, comparing the costs of their activities, and analyzing the differences in their operations can be very insightful to transfer efficient practices across networks. The model is not used to directly compare the performance of suppliers in the same network to each other. Comparisons are only made against the network average. However, when two suppliers in the same network agree on a direct comparison, the model can be used for that purpose.

Strategic what-ifanalyses are performed to analyze the effects of changes in the supply

chain on supply chain costs. When, for example, as a result of a benchmark analysis, Sainsbury and a supplier have developed ideas or scenario's for improving processes, the model is used to calculate an indication of the expected cost changes. In these scenario's the expected changes in cost drivers are used as input for the analysis, and the outcome consists of the expected change in supply chain costs. All projects that are initiated for improving the supply chain are evaluated by a strategic what-if analysis.

Trend-analyses are performed for monitoring the development of supply chain costs over time, and to intervene when necessary. These analyses are made on a quarterly basis, after each update of the model.

An example of a supply chain analysis

An example of a benchmark and a strategic what-if analysis that were performed for supply chain improvement relates to the use of plastic crates for chilled products. Before the model was developed, Sainsbury' and a large supplier had a discussion about the use of these crates to improve the efficiency of product handling activities. As the cost consequences of adopting these crates were unclear to the supplier, Sainsbury was not able to persuade the firm to adopt these crates. When the model was developed, it was used to calculate the supply chain costs related to suppliers using the crates and the costs of the non-adopting supplier. The differences resulting from this benchmark analysis revealed a cost advantage for the adopting suppliers. The next step was to analyze what changes would occur in the supplier's and Sainsbury's activities, when the supplier would adopt the plastic crates. By feeding these changes into the model, a strategic what-if analysis could be performed to calculate an indication of how much supply chain costs could be reduced. This analysis made possible to show the supplier the cost consequences of adopting the crates, which made subsequent negotiations between the parties about the adoption decision much easier.

Decision making and negotiations

When an idea for improvement is identified, and both parties agree to work it out in more detail, Sainsbury treats this idea as an investment proposal. The proposal is then carried over to the management accountants, who perform a profitability analysis to calculate an expected rate of return. When the expected return is sufficient, the proposal is accepted for further negotiations with the supplier. The results of a change in the supply chain do not necessarily result in (equal) benefits for both Sainsbury and the supplier. Often these changes result in an asymmetrical division of investments, costs and benefits. For instance, while the adoption of plastic crates can result in a cost reduction for the supply chain as a whole, it can result in a cost increase for the supplier, while the benefits of improved efficiency are mainly reaped by Sainsbury. This results in an allocation problem among the parties for the cost and profit consequences of the supply chain changes and for the investments that need to be made. This allocation problem needs to be resolved in negotiations, otherwise the party being left with a disadvantage would not be willing to adopt and implement the change. In these negotiations, Sainsbury uses the investment proposal for agreeing on an acceptable division of costs, benefits, and investments. For example, a possible solution in the negotiations with the supplier about adopting the plastic crates is that Sainsbury invests in the required handling equipment for the supplier. Another solution is that Sainsbury agrees on a price increase for the suppliers' product, which for Sainsbury is more than offset by the cost reduction.

5. Discussion

Sainsbury's supply chain cost model is a real-life example of the use of the principles of VCA in an interfirm setting. Compared to the discussions of VCA in literature, how-

ever, this application is characterized by a limited range of activities in the value chain, as only supply chain activities are modeled. An analysis of the complete value chain would require to also include the activities preceding the supply chain logistics of the suppliers (e.g., production, and purchasing of raw materials) and those succeeding the logistics of the stores (e.g., sales to customers). Nevertheless, the model does cope with Hergert and Morris' (1989) critique on traditional accounting systems for supporting a VCA. First, it focuses on the activities in the value chain. Second, it reflects the economics of performing those activities by accumulating data on the drivers of costs. Third, it accounts for interdependence between activities across firms. In one way, the model actually goes beyond the VCA as currently described in literature, as it not only analyzes costs at the leve1 of the individual supply chain, but also does this at higher levels of analysis, such as at the network level.

The use of this cost model for supporting SCM practices has several effects on the relationships between Sainsbury and the participating suppliers. One way to analyze these effects is to focus on the communications taking place between Sainsbury and the suppliers as a result of the model. Three types of discussions originate between the parties due to the model: (1) discussions about the provision of (sensitive) information by the suppliers, and its use by Sainsbury, (2) discussions about current supply chain performance, and how changing the supply chain may improve this performance, and (3) negotiations about the sharing of costs and benefits that result from supply chain changes. The provision of cost and activity information by the suppliers to Sainsbury by reveals their relative efficiency compared to other suppliers. This makes tbem vulnerable to potentially opportunistic behavior of Sainsbury, who can exploit this knowledge to its own benefit. Although the model in principle is used to identify inefficiencies at suppliers, it is not used in an adversarial way, for example, by demanding efficiency improvements or selecting more efficient suppliers. For the early participants this kind of

(ab)use of the information they provide was an important issue. The project manager expressed this concern as follows:

"Its not the agreement we have with the suppliers in them supplying the data with US. [....] we said very specifically that we would not be using it to sort of bash people with it. Its not for that, its to help US develop a supply chain, not to start comparing suppliers, and saying increase your efficiency up to the same level or Sainsbury is getting you out. Because that's obviously one of the concerns suppliers had. You know, the last thing they want is to give US data, very sensitive data andfor US then to say well you are actually really inefficient, we have to get rid of you".

Would Sainsbury use the information in an opportunistic way, then the suppliers' willingness to cooperate would vanish quickly, relationships would be damaged, and the cost saving potential in the supply chain would remain unrealized. The fact that suppliers do share this sensitive information acts as a signal of their trust in Sainsbury's goodwill, while the reciprocating actions of Sainsbury (i.e., not taking advantage of the information), reinforces this mutual bond of trust.

The second type of discussions relate to the use of the supply chain analyses for initiating and supporting SCM practices. These discussions have a positive effect on the relationships between Sainsbury and suppliers in at least two ways. First, the use of the analyses leads to an increased interaction between the parties about possible improvements. As argued before, no direct action is taken on basis of the results of the analyses. Instead, the data is taken to the supplier, and discussions are initiated about the underlying operations, and what actions could be taken to improve these operations. Second, compared to other retailers, suppliers come to Sainsbury first with new ideas for supply

chain improvement, as the effects of these ideas can be 'tested' with the model.

The identification of beneficial actions to from the previous discussions leads to a third issue for discussion, the profitability of proposed changes, and the allocation of benefits and costs between Sainsbury and the supplier. The calculations of and negotiations about benefits and costs that take place comply with Tomkins' (2001) argument that collaborative decisions need to be taken based on two levels of analysis. First the investment must eam an adequate rate of return for the risks associated with the project, and second the partners need the prospect of receiving a fair share of the benefits, before they are willing to participate in the project.

From her case research, Lord (1996) believes the results attributed to SMA are nothing more than the logica1 consequences of effective operational management processes. She argues that when firms focus on cooperative relationships with suppliers will, as a result, automatically reap the benefits of exploiting their linkages. NO forma1 VCA needs to be done for that purpose. She supports this critique with the fact that at the time of her publication no empirical prove or examples were present of companies actually using such practices.

This exploratory case study results in just the opposite conclusion: the use of the cost model to perform supply chain analyses gives insight into the economics and interdependencies of activities in the supply chain, which insight would have been diffícult to obtain without the model. Thus in this situation, the VCA *adds* to an understanding of the performance of the supply chain and the cost consequences of changes. This understanding is the basis for actions to better exploit the linkages in the supply chain.

In addition, it can be questioned whether at the time Lord's paper was published, it was a reasonable expectation that much empirical data on the subject should have been present. Argued from a diffusion of innovations perspective, it can be expected that it will take some time for organizations to adopt the innovation, after it has been introduced to them. First, early adopters will try the innovation, and when successful, the number of adopters will increase based on these early adopters' success. In Finland, for example, the beginning of such a diffusion process was found to characterize the adoption process of ABC (Malmi, 1999). And chances are high that after adoption, firms will first use ABC for internal purposes, before thinking about using it in an inter-firm context (although Sainsbury did not have an ABC system, when the model was developed).[12]

In addition, professional organizations, such as ECR Europe, are promoting the use of ABC for supporting SCM heavily, by positioning it as an 'enabling technology' (Coopers & Lybrand, 1996). And the recent surveys of Chenhall and Langfield-Smith (1998) and Guilding et al. (2000) show that companies are adopting VCA, at least for internal purposes. A logica1 step following this adoption could be to use this intemal cost and performance information for SCM efforts with buyers and suppliers, similar to what Sainsbury does. The previous trends at least indicate that practice does have a growing interest in these SMA practices, and that more empirical research in this area may be fruitful.

6. Conclusions and directions for further research

This paper discusses an exploratory case study Sainsbury' use of a cost model to support supply chain management practices, which builds the concept of VCA. This activity-based costing model integrates cost information about supply chain activities of both

Sainsbury and suppliers, and serves several functions. First, it is used to analyze the cost performance of supply chain activities, both at the individual supplier level, as well as at the supplier network level. This information is then used in communications with suppliers to analyze the causes of this performance, and to generate 'ideas for improvement'. Second, when such ideas are generated, the model is used to calculate the cost impact of changes in supply chain activities. Third, the model is used to periodically monitor the development of supply chain costs.

This VCA practice identified at Sainsbury goes beyond the idea of performing an analysis of activities in the value chain by just one organization taking an 'external perspective'. In this case the analysis is made cooperatively with suppliers by integrating their cost data. It can be expected that due to sensitivity of the data involved and the fear of participants for other (ab)use of the information than it was intended for, that this type of information sharing will only occur in interfirm relationships characterized by a sufficient level of trust in the other's cooperative intentions.

This study presents a rather technical description of the cost model's goals, design and use. This VCA model, however, is not the only accounting information used in the SCM practices of Sainsbury and its suppliers. For example, for coordinating supply chain activities Sainsbury measures, exchanges and discusses non-financial performance indicators with suppliers. A more comprehensive view on the use of VCA and other accounting information in interfirm relationships would be gained by making more explicit use of theory in the research design, and by studying it in relation with other formal and informal mechanisms used in supply chain relationships for coordination and control purposes (Dekker, 2000). This would require more in-depth knowledge of specific characteristics of relationships, such as transaction cost considerations, coordination problems, and the social context in which the relationship is embedded. Such an

analysis, however, goes beyond the scope of the present paper, and is therefore regarded as a fruitful direction for future research.

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8. Notes

[1] Tomkins (2001) provides an in-depth analysis of the different information needs of types of alliances at different stages of development, for the warranting of trust and for the 'mastery of events'.

[2] This govemance structure can be implemented formally by contract, but can also consist of various informal and organizational agreements (Dekker, 2000).

[3] In the context of interfirm relationships, Gietzman (1996) identifies an important shortcoming of the traditional make-or-buy analysis. He argues that the conventional textbook method to perform this analysis (tbat bases the decision criterion only on purchasing versus internal production costs) is incomplete and can even obstruct the initiation of a principally valuable cooperation between buyer and supplier. This static make or buy analysis simply results in a short-term oriented decision whether to internally produce or to buy externally. Interfirm relationships, however, are often oriented towards a longer term and are characterized by dynamism. This requires altemative forms of accounting information that include this dynamism, and that motivate the partners to focus on innovative cooperation. In addition, this information needs to include the costs of governance structures of cooperation and intemal production, not only production and purchasing costs.

[4] This is only the case when insufficient contractual agreements are made for that dealing with this allocation problem directly

[5] However, as cost data of different firms across the supply chain is required, additional problems of accounting information can be anticipated. Difficulties might be experienced with differences between accounting systems, leading to incompatibility of the information they provide.

[6] Although Shank and Govindarajan (1992, 1993) argue that ABC is only one of several frameworks for strategic cost analysis. Other frameworks, such as the cost of quality framework, can also be beneficial for strategic cost analysis, although it is not directly clear how these relate to a VCA.

[7] This prior available data included the presentation slides, describing the design and use of the cost model, general company information from annual reports and the internet, and specific publications in which Sainsbury was subject of analysis (Frances and Garnsey, 1996; Wheatley, 1998).

[8] See also Eqos case studies (2001) for more specific information about SID.

[9] In addition to cost analysis of the supply chain, other management accounting practices have been employed for this purpose, for example the exchange of performance information with suppliers by SID on a range of performance indicators for coordination and the identification of possibilities for improvement with suppliers.

[10] Gosselin (1997) distinguishes three levels of activity management, (1) *Activity Analysis* (AA), which does not account for costs *(2) Activity Cost Analysis* (ACA, also called *Cost Driver Analysis*), which allocates costs to activities and cost drivers and (3) *Activity-Based Costing* (ABC), which allocates costs of activities to cost objects, such as products and services.

[11] In addition, it was commented that it will easily be noticed when a supplier's data deviates significantly from the other suppliers' data. When this happens, it is normally the result of an error during data collection or input.

[12] Also, one needs to acknowledge that it takes time for firms to develop and implement these systems, just like that it takes quite a while before researchers will publish about such applications, when they identify them.